CITY OF TORONTO
DEPARTMENT OF PUBLIC HEALTH

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To: Board of Health

Subject: Final Report on Blood Lead Screening in the Bathurst-Niagara Street Area -- 1984

Origin: Medical Officer of Health, January 10, 1985
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Comments:

At its meeting on September 25, 1984 the Board of Health approved the undertaking by the Western Health Area of a limited screening program for high blood lead levels in children and pregnant women living near the secondary lead smelter on Bathurst Street. An interim report on the results of this screening was submitted to the November 20, 1984 meeting of the Board of Health. The final report of the program is attached.

Recommendation

That the Board of Health approve the recommendation on page 12 of the attached report.

IM:tc
Attach.

A.S. Macpherson, M.D., M.Sc.,
Medical Officer of Health.

WESTERN HEALTH AREA 1984 BLOOD LEAD SCREENING

BATHURST-NIAGARA STREET AREA - FINAL REPORT

INTRODUCTION

The Department of Public Health has carried out many screening programs to detect high blood lead levels in residents living near Toronto Refiners and Smelters Ltd. on Bathurst Street. The results of these programs have contributed to efforts of the Ontario Ministry of the Environment to impose stricter control of lead emissions from the smelter. The last such screening program took place in 1980.

In 1984, renewed community concern about the possibility of excessive lead exposure near the smelter was apparent. It was observed that the lead content of dustfall collected by the Ministry of Environment at four sites close to the plant boundaries frequently exceeded provincial guidelines during 1983. Dustfall lead contributes to the lead content of soil, which may be ingested by young children playing outdoors.

In light of these factors, the Board of Health approved a limited blood lead screening program for children in the Bathurst-Niagara Street area to determine whether or not a significant health hazard exists and whether more extensive screening should once again be undertaken. This report contains the results of blood lead screening carried out by the Western Health Area in October, 1984, in the Bathurst-Niagara Street Area.

METHODS

Children five years of age and younger and pregnant women living within 500 metres of the center of Toronto Refiners and Smelters Ltd. were selected as the target population. Young children were included because of their potential exposure to lead-contaminated soil, and pregnant women due to the increased susceptibility of the fetus to the effects of lead.

Two evening clinics were held at St. Mary's School on Portugal Square on October 10 and 11,1984, with the permission and cooperation of the Metropolitan Toronto Separate School Board. All residents living within 500 metres of the smelter were informed of the location and time of the screening clinic approximately one week in advance by door-to-door delivery of bilingual flyers. A census of the target population was carried out concurrently with flyer distribution.

Blood samples obtained at the clinic by finger prick were sent to the Ontario Ministry of Health Laboratory for analysis. Duplicate samples were obtained from approximately 20% of those tested and sent to ESA Laboratories in Massachusetts for confirmation.

Individual results and a copy of the pamphlet "Get the Lead Out" were mailed to all those tested approximately two weeks after the clinics. Individuals with test results greater than 30 ug/dl were contacted by a public health physician and immediately referred to the Hospital for Sick Children for medical assessment. Individuals with test results greater than 20 ug/dl were visited by a public health nurse and public health inspector who administered a questionnaire and examined the home environment in order to discover any sources of lead exposure. Confirmatory venous blood lead testing was performed for these individuals, and soil samples were taken by the Ministry of the Environment for lead analysis.

RESULTS: TARGET POPULATION CENSUS AND PROMOTION

The target area, i.e., all homes within 500 metres of a central point on the Toronto Refiners and Smelters Ltd. property, extends north to Portugal Square, west to Stanley Park, and east to Draper Street. Non-residential areas south of the Canadian National Railway tracks were not included.

The outcomes of multiple visits to the 913 residences in the target area are summarized below.

Census Visit Outcomes

# Residences	Outcome
46	vacant
80	no answer after multiple visits
369 (in 1 apt. building)	inaccessible - Department staff denied access to 369 occupied units in an adult apartment complex
418	interviewed
913	Total

The 418 residences for which census information was obtained represents 84% of occupied accessible residences in the target area. Promotional flyers were distributed to all residences regardless of whether the occupants were interviewed. Sixty-six (66) children 5 years old and under, and 15 pregnant women were reported to be living at the 418 residences whose occupants were interviewed. The target population estimates below are based on the assumption that residences which were inaccessible or did not answer contain the same number of young children and pregnant women per residence as those whose occupants were interviewed. However, it was assumed that no children were living in the inaccessible adult apartment complex.

Estimated Target Populations Within 500 Metres of Toronto Refiners and Smelters Ltd. October, 1984

Target Group	Population
Children 5 years old and under	80
Pregnant women	30
TOTAL:	110

CHARACTERISTICS OF POPULATION SCREENED

As summarized below, a total of 57 persons attended the screening clinics. Thirty-five of these were from the target groups. This represents an attendance of approximately 29% of the estimated target population of young children, and 40% of the estimated target population of pregnant women.

Characteristics of Population Screened

1. Target Population	Number of Persons
. Children 5 years old and younger living within 500 metres of smelter	23
. Pregnant women living within 500 metres of smelter	12
. Subtotal	35
2. Others	
. Children 5 years old and younger living more than 500 metres from smelter	9
. Pregnant women living more than 500 metres from smelter	2
. Other adults and children	11
TOTAL:	57

The age and sex distribution of the screened target population of young children are summarized below:

Population Screened
Children Under 6 Living Within 500 Metres
of Toronto Refiners and Smelters

Age (Years)	Number of Children		
	Male	Female	Total
Less than 1	2	0	2
1	3	1	4
2	4	1	5
3	0	2	2
4	3	3	6
5	4	0	4
TOTAL:	16	7	23

The mean age of pregnant women screened was 27 years, with a range of 24 to 30 years. The target groups screened may be further characterized in terms of location of residence.

Location of Residence of Screened Target Population

Distance of Residence from Toronto Refiners & Smelters Limited	Number of Persons	
	5 Yrs. Old & Under	Pregnant
0-100 metres	-	1
101-200 metres	-	1
201-300 metres	2	1
301-400 metres	3	1
401-500 metres	18	8
More than 500 metres	9	2

The small number of persons screened who reside in the areas closest to the smelter largely reflects the smaller size, and

hence, the smaller population in those areas. For example, the door-to-door census revealed only 1 child under six and 1 pregnant woman living 0-100 metres from the smelter, and only 4 children under six and 1 pregnant woman living from 101-200 metres away.

The results of screening for the designated target population are summarized below:

Blood Lead Levels in Screened Target Population

Target Population	Number Screened	Blood Lead (ug/dl) Mean	Minimum	Maximum
Children 5 years old and under within 500 metres of smelter	23	12.2	4.1	26.5
Pregnant women within 500 metres of the smelter.	12	7.2	2.7	16.1

There was no statistically significant association between proximity of residence to the smelter and blood lead level for either target group. However, the overall target area was relatively small and few individuals living within 200 metres of the smelter were tested.

LABORATORY QUALITY CONTROL ASSESSMENT

The Ministry of Health Biochemistry Laboratory performed blood lead determination on specimens from all individuals screened. There is no reason to question the quality of the work done by this laboratory, which participates in a number of quality control programs. Nevertheless, as a matter of routine, duplicate blood samples were taken from approximately 20% of individuals screened and sent to ESA Laboratories in Massachusetts for comparison. An analysis of these results indicates that the results reported by the Ministry of Health Laboratory were on average 2 ug/dl higher than those reported by ESA Laboratories. This difference is statistically significant but of doubtful clinical significance, and may be attributed to the different analytic methods used by the two laboratories. The Atomic Absorption Spectrophotometric method used by the Ministry of Health is known to give slightly

higher results than the Anodic Stripping Voltammetry method used by ESA Laboratories.

COMPARATIVE ANALYSIS OF BLOOD LEAD LEVELS

In order to assess whether individuals living near Toronto Refiners and Smelters are at higher risk for lead absorption than they would be if they were not living near the smelter, a comparison of their blood lead levels with some standard must be made. Unfortunately, most recent blood lead testing carried out in Toronto has involved populations who are believed to have increased exposure to lead, and are thus not representative of the general population. A survey of blood lead levels in urban and rural areas of Ontario which has recently been carried out by the provincial government included individuals in the Toronto area. The results of this survey, when available, will likely provide the best standards for comparison with the present screening population. In the meantime, two useful comparisons may be made for children 5 years old and younger.

The best currently available local standards for young children are the results of blood lead testing of a group of seventy-one (71) Western Health Area Grade 1 school children not known to be exposed to unusual environmental sources of lead. These children were tested in 1982 as a control group in a study of school children in the South Riverdale area of Toronto. They are not comparable to the present group of screened children in terms of age, and there is insufficient information to determine their comparability for such variables as ethnicity and socio-economic status. The mean blood lead level of this group of Grade 1 children was 12.6 ug/dl, which when adjusted for age difference between the two groups is not significantly different from the mean of 12.2 ug/dl for children 5 years and under living within 500 metres of Toronto Refiners and Smelters. While the interpretation of this analysis is limited by the small sample sizes and potential problems of comparability outlined above, it offers some reassurance that blood lead levels found in children in the Bathurst-Niagara Street area are not dramatically different from those of children who do not live near an environmental lead source.

A comparison which will inevitably be made is that between blood lead levels of children screened in the Bathurst-Niagara Street area and those in South Riverdale, where annual screening has been carried out for a number of years in an area near a lead smelter where soil lead levels are known to be elevated. Consequently, the results of the screening program for children 5 years and under in South Riverdale in 1984 were statistically compared with the results of the present screening program. The mean blood lead

level of 15.5 ug/dl in a group of 216 South Riverdale children in 1984 was significantly higher than the mean of 12.2 ug/dl in the Bathurst-Niagara Street area children. ($p<0.05$).

FOLLOW-UP OF SCREENING RESULTS

As outlined in the description of screening program methods, all individuals with blood lead levels greater than 20 ug/dl were assessed for environmental sources of lead exposure and underwent a confirmatory venous blood lead testing regardless of whether or not they were part of a target population. The distribution of blood lead values for all individuals screened is summarized below.

Distribution of Blood Lead Values
(all persons tested)

Blood Lead Level	Number of Persons
0-9 ug/dl	23
10-19 ug/dl	31
20-29 ug/dl	2
30+ ug/dl	1
TOTAL:	57

Details of the follow-up of the three persons with screening test results greater than 20 ug/dl are as follows:

Individual	Screening Test Result	Confirmatory Venous Blood Lead Level
1. 7 year-old male living more than 500 metres from smelter.	30.6 ug/dl	5.6 ug/dl
2. 47 year-old female living more than 500 metres from smelter.	21.6 ug/dl	10.4 ug/dl
3. 3 year-old female living within 500 metres of smelter.	26.5 ug/dl	11.1 ug/dl

The confirmatory venous blood lead test for the first individual was performed soon after the screening test, and several siblings from the same family had low screening test results. It is thus likely that the initial finger-prick blood sample contained falsely high lead levels due to skin contamination; and no further assessment has been undertaken. The second individual was assessed for domestic and occupational exposure to lead, but no explanation for the initial elevated screening test level could be found. It is possible that skin contamination is also responsible for this result, but the individual has been advised to have a repeat venous blood lead test in 1985.

The third individual, a member of the target population of children under six years of age living within 500 metres of the smelter, underwent confirmatory venous blood testing only in December, 1984. Investigation had revealed no obvious domestic source of lead. The initial high screening test result could be a false positive or it could reflect transient exposure to outdoor lead sources in the summer and early fall which did not influence the blood lead value obtained in December. It has been recommended that this child be retested during the summer of 1985. Soil samples for lead analysis have been obtained by the Ministry of the Environment from the properties of individuals with high blood lead levels, but results are not yet available.

CONCLUSIONS

The limited screening program described in this report was undertaken in order to assess whether or not a significant health hazard due to lead exists in the Bathurst-Niagara Street area, and whether more extensive screening should be undertaken.

With respect to the presence of an important health hazard, the screening results are reassuring. The mean blood lead level in young children was similar to that in children not living near a major environmental lead source. Only one of the fifty-seven (57) individuals screened had a test result in the range where medical referral is indicated, and this result likely was falsely elevated. Whether or not blood lead levels in individuals living in the Bathurst-Niagara Street area are at all higher than those in the general urban population cannot be accurately determined until suitable standards are available for comparison. The results of this screening program will be compared with the results of the recent provincial survey of blood lead levels when they become available.

It is not possible to be as confident about the absence of hazard for those few individuals living very close to Toronto Refiners and Smelters Ltd. (i.e., within 300 metres), because so few of them were screened. This group is of special concern because of their proximity to the major lakeshore traffic routes, and because of the pattern of dustfall lead content which has been high at monitoring stations immediately adjacent to the smelter. The risk to these few individuals has not been adequately assessed.

The results of the limited screening program described in this report do not indicate a need for a more extensive screening program directed at a larger target population.

PROPOSAL

In view of the small numbers of persons screened in 1984 who live within 300 metres of Toronto Refiners and Smelters Ltd., it is proposed that a highly selective blood lead screening program be carried out in this area by the Western Health Area staff in the late summer of 1985. This time of year is preferred since children have been playing outdoors all summer. The target population will be children 5 years old and younger and pregnant women living within 300 metres of Toronto Refiners and Smelters Ltd. The estimated size of this population, based on the 1984 door-to-door census, is approximately 25 persons. Special efforts will be made to encourage the participation of this group.

The screening and follow-up methods will be the same as those used in the 1984 program. It is anticipated that the cost of this program will be absorbed within the Western Health Area budget.

RECOMMENDATION:

That the Board of Health approve the proposal for blood lead screening of children and pregnant women living within 300 metres of Toronto Refiners and Smelters Ltd., to take place in the late summer of 1985.